ABSTRACT

A conventional diffractive optical element (DOE), which consists of repetition of a unit pattern Υ, has an advantage of applicability of the Fast Fourier Transform algorithm to calculate diffraction beam spots intensities on lattice points on an image plane. But, the conventional DOE has a drawback of impossibility of diffracting a laser beam off the lattice points. This invention designs a DOE by giving arbitrary complex amplitude transmittance $\{t_{mn}\}$ to every pixel (m, n), calculating actual Fourier transform from $\{t_{mn}\}$ to intensity $W(\alpha, \beta)$, and obtaining intensity of a diffraction beam directing in any α and β direction. Since α, β are not necessary to be on lattice points, the FFT is of no use. Angular resolutions U and V satisfy inequalities $U < \lambda/aR$ and $V < \lambda/bS$, where λ is a wavelength, aR and bS are the size of the DOE. The DOE can produce multidiffracted beams anywhere on an image and can irradiate a plurality of arbitrary arranged points simultaneously with high precision. The DOE realizes precise multispot microprocessing on arbitrary positions, which is required for producing electronic parts. The DOE is suitable for high speed and low cost laser processing.